LIBRARY OF CONGRESS
RECEIVED
JUN 11 1903
PER

THE METAL INDUSTRY

With which is Incorporated The Aluminum World.

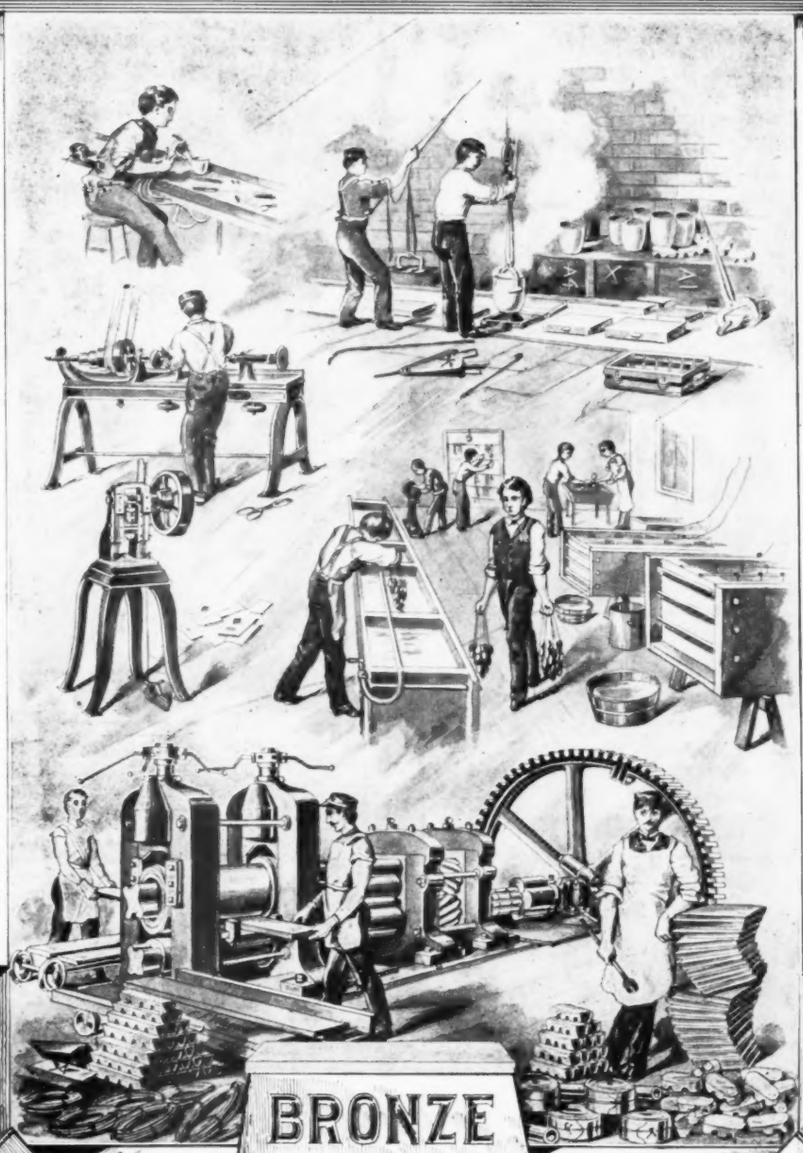
The Brass Founder and Finisher and Electro Platers Review.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

ALUMINUM · COPPER · NICKEL · TIN · SILVER · LEAD · GOLD · ZINC

METALLOGRAPHY · BRASS · METALLURGY

MELTING · CASTING · REFINING · SOLDERING · BRAZING · PLATING · ROLLING · DRAWING · STAMPING · SPINNING · TUBE MAKING · SOLDERING ·



BRONZE

OLD SERIES
Vol. IX., No. 6
Vol. I., No. 6.
NEW SERIES

LABOR OMNIA VINCIT

JUNE, 1903

NEW YORK.

61 BEEKMAN ST.

$1.00 PER YEAR

10 CTS PER COPY

Copyright, 1903, by the Metal Industry Publishing Company.

Entered February 10, 1903, at New York, N. Y., as second-class matter under act of Congress, March 3, 1879.

The Wonderful Wearing Qualities of

AJAX PLASTIC BRONZE

Combined with its diminished tendency to heating, makes it superior to all other compositions for

BEARING PURPOSES

Sold in ingots or castings of every description.

THE AJAX METAL COMPANY,

PATENTEES AND SOLE MANUFACTURERS **PHILADELPHIA.**

Have you tried

The

GAUTIER CRUCIBLE??

Manufactured for 45 Years by

J. H. GAUTIER & CO.

JERSEY CITY, N. J.

L. VOGELSTEIN
90-96 Wall St., NEW YORK
REPRESENTING
ARON HIRSCH & SOHN
Halberstadt, Germany

Metal Dealers and Refiners
COPPER AND BRASS ROLLING AND TUBING MILLS

TEN MILES OF CHAIN PER DAY

(Cut shows our Triumph Pattern)

TWICE THE STRENGTH OF WELDED

is what our chain shows in steel, and you will be surprised at its strength in other metals. Send for samples and data.

THE ONLY STRONG ALUMINUM CHAIN

THE BRIDGEPORT CHAIN CO., BRIDGEPORT, CONN.

NOTICE. MATERIAL FOR DRYING PURPOSES
SILVER, NICKEL PLATERS AND BRASS GOODS MFRS.
Write for prices to **John Sommer's Sons,** 355-365 Central Ave., Newark, N. J.

High Grade Spelter and Some of Its Faults.
The Production of a Black Color on Brass.
Forging Aluminum Bronze.

The above articles were first published in THE METAL INDUSTRY.

NO grinding up of old crucibles to make new pots. Some crucibles are made that way. That kind causes loss of money, metal and sometimes life. McCullough-Dalzell crucibles are always uniform — always dependable

If Interested Write

The McCullough-Dalzell Crucible Company

PITTSBURG, PA.

Two Copies Received
JUN 11 1903
Copyright Entry
CLASS XXc. No.
COPY B.

THE METAL INDUSTRY

With which is Incorporated The Aluminum World.

The Brass Founder and Finisher and Electro Platers Review.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS

OLD SERIES
VOL. IX., NO. 6.

NEW YORK, JUNE, 1903

NEW SERIES
VOL. I., NO. 6

THE METAL INDUSTRY

AND

The Aluminum World

AND

The Brass Founder and Finisher

AND

Electro Platers Review

PUBLISHED MONTHLY BY

THE METAL INDUSTRY PUBLISHING COMPANY,

(Incorporated)

61 Beekman Street, New York

PALMER H. LANGDON, - - - - - *Publisher*
ERWIN S. SPERRY, - - - - - - *Editor*
JOHN B. WOODWARD, - - - - - *Director*

Subscription Price $1.00 per year, postpaid to any part of the world. Single copies, 10 cents

ADVERTISING RATES ON APPLICATION

COPYRIGHT, 1903 BY
THE METAL INDUSTRY PUBLISHING COMPANY

Entered February 10, 1903, at New York, N. Y., as Second Class Matter Under Act of Congress March 3, 1879.

SEAMLESS VS. BRAZED TUBING.

Considerable interest is manifested by the manufacturers of brazed brass tubing on account of the report that, within a short time, there will be a reduction in the price of the seamless product, which will place it entirely on a parity with the brazed. Heretofore, brazed tubing has been sold at a lower price than the seamless, except in a few iron pipes, sizes of the latter which, of course, cannot be compared with brazed because there is no demand for this product in such sizes. The demand for brazed brass tubing is, for the greater part, in the gas fixture and chandelier trades, and whether the color of the ordinary seamless tube will answer as well for this purpose as that of the common brazed product remains to be demonstrated. Brazed brass tubing as ordinarily made consists of 72 per cent. of copper and 28 per cent. of zinc, while seamless contains 62 per cent. of copper and 38 per cent. of zinc. The color of these two alloys is somewhat different and may be one of the stumbling blocks in the way of the universal supplanting of brazed tubing by seamless.

It is said that the adoption, by several mills, of certain new processes for making seamless tubes has been instrumental in bringing about this condition. The cost of mixture is certainly greatly in the favor of seamless manufacture, and we see no reason why, with stock sizes and in orders of considerable magnitude, the change should not be gradually brought about.

THE INVASION OF THE SAND-CASTING TRADE BY THE ROLLING MILL.

A brass rolling mill, which manufactures special shapes of brass by a method known as the extrusion process, is now invading, to a certain extent, the field already occupied by the sand-casting industry. This is quite natural and we see no reason why, in certain specific uses, sand castings should not be replaced by shapes made by this method. The extrusion process consists in "squirting," so to speak, brass through various forms of dies while it is red-hot, by means of hydraulic pressure, so that long

lengths of various complicated sections are produced. These are afterwards cut up in automatic machines. It will be readily seen that this method has certain advantages over the use of sand castings. This process has been in use in England for some time but was recently introduced into the United States.

We predict a future for this process as, coming in long lengths as the shapes do, the automatic machines may be used to a great extent in machining it. We do not, however, fear at all the replacing of sand castings to any great extent by it for the reason that the cost of the material even before cut off is very much greater than that of castings. Again, only certain forms can be utilized; those, in fact, in which every portion is parallel. The mixture, of the metal, too, must be kept within narrow limits and those alloys can only be used which will work hot. This precludes, to a certain extent, the use of a free-cutting metal so necessary in machines working at a high speed. Leaded brass, however, may be made in the extrusion machine, but the mixture to which the lead is added is hard and the amount of lead small, so that the resultant metal is not, by any means, the free-cutting material that is found in a good brass casting. The extrusion process may be, perhaps, cheapened, but at the same time sand-casting is undergoing a process of evolution in the use of the molding machine, cheap melting, and similar conditions so that brass sand castings are certain to reach a figure lower than even the present price. Our notion of the extrusion process, then, is that it will open up new uses for brass not hitherto found but will only replace brass sand castings to a limited extent.

AMARILLIUM.

While assaying some copper ore from British Columbia, William M. Courtis, of Detroit, Mich., claims to have discovered a new metal and has called it *Amarillium*. The new metal appeared with the gold and silver which he obtained from the ore and when dissolved in nitric acid, gave a deep orange color; hence the name. In appearance, he says, the metal resembles platinum although much harder.

We understand that an element of this nature has been bothering certain silver and gold refiners who have had copper from this section from which the silver was separated electrolytically. Either this metal (if its existence is thoroughly proven) or one of a similar nature, has remained in the silver, even after nitreing, and imparted a yellow color to the solution of nitrate of silver made from it. This yellow color, of course, is objectionable in nitrate of silver, but we have yet to learn of any deleterious effect being caused by the actual existence of the metal in the silver itself. Most of it, however, remains with the gold in parting and causes brittleness.

Copper and antimony form a series of alloys of no commercial value, as they possess neither strength nor the property of rolling into sheet. The alloy of equal parts of copper and antimony has a beautiful purple color, but is very brittle.

THE IMPORTANCE OF THE VOLTMETER AND AMMETER IN ELECTRO-PLATING.

It is surprising to find the large number of plating establishments without either voltmeter or ammeter among their equipment. Some are even without a rheostat.

The function of these instruments is not well understood by the majority of electro-platers, otherwise their use would be more extensive. It may be said that the electric current is analagous to water under pressure. The *voltage* or *tension*, as it is often called, is the pressure, while the quantity is designated by the term *ampere*. In electro-plating the voltage of the electric current determines whether it is possible to plate or not. If the voltage is insufficient, the metal will not deposit at all. Each metal in solution requires a different voltage for its deposition and this is one of the reasons why it is much more difficult to plate with an alloy such as bronze or brass than with a single metal. In fact, it is possible, by simply altering the voltage to separate one metal from another. For instance, let us suppose that we have a solution containing nitrate of silver and sulphate of zinc. The tension value of the nitrate of silver or the voltage required to deposit the silver is 0.70 volt, while that necessary for the zinc is 2.35 volts. If, therefore, a current of 0.70 volt is used only the silver will be deposited. Increase the voltage to 2.35 and the zinc will separate.

The influence of the quantity or number of amperes of current flowing determines both the character and rate of deposit. Increasing the number of amperes, while depositing the metal more rapidly also causes the deposit to become spongy or non-adhering. There is a certain number of amperes of current which is normal for a given amount of work. It is always determined by the number of square inches of surface to be plated. If 50 amperes of current is found to be right for a certain amount of work, then 100 amperes should be used if the amount of work is doubled. Too weak a current gives a slow deposit, and one which does not cover well or is inclined to adhere in spots. On the other hand, too strong a current piles up the particles of metal so rapidly upon one another that they refuse to stick and the deposit is then either spongy or actually falls to the bottom of the vat. To regulate this current strength is the function of the rheostat. To determine the proper amount of current requires a knowledge of condition and amount of cathode or work surface. The plater soon learns this, however, and after once determined should be strictly maintained by means of the rheostat and ammeter. We believe that there is no metallurgical process where so many details must be carefully looked after as in electro-plating, and the sooner the "rule of thumb" methods are discarded and accurate methods substituted the less will be the difficulties and the better the quality of the work.

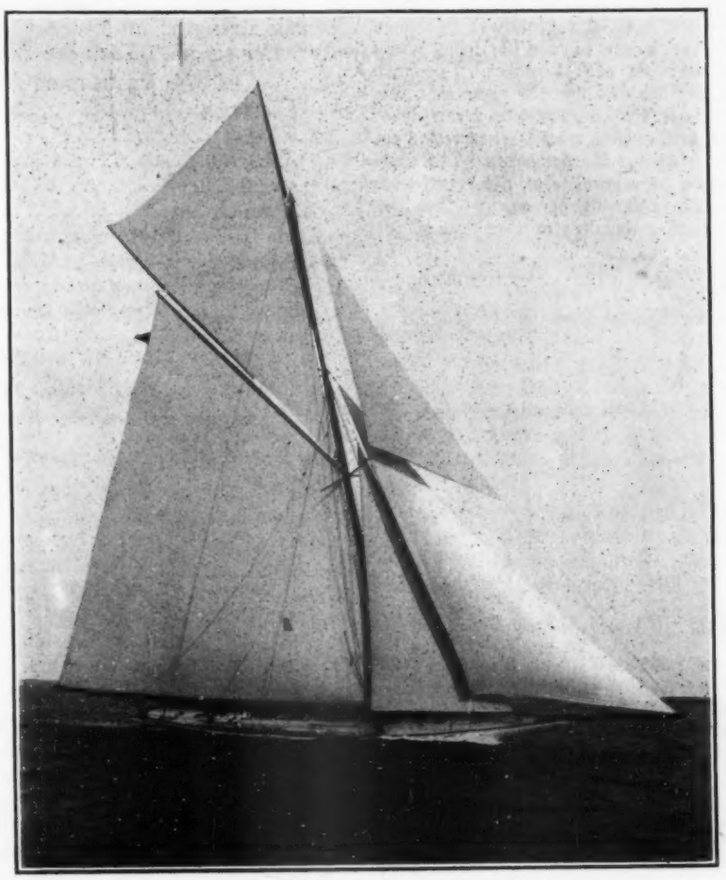
The American Institute of Electrical Engineers will hold their annual convention from June 29 to July 3 at Niagara Falls, N. Y. An attractive list of papers has been promised and excursions have been arranged of technical and engineering interest.

TOBIN BRONZE, ITS COMPOSITION, HISTORY AND USE IN THE YACHT "RELIANCE"

By Erwin S. Sperry.

The fact that Tobin Bronze has been used in the construction of the last three cup defenders, demonstrates the good qualities of this material for marine use. It combines both strength and non-corrosiveness, qualities which are paramount to everything else in the construction of a boat, the quality of which has never yet been surpassed.

Tobin Bronze is nothing more than brass containing a small amount of tin, but it is to this small admixture that the value belongs, for without it, neither the strength nor the non-corrosive properties could be obtained. It has recently been demonstrated that a small amount of tin in high brass renders it very much less attacked by sea water than the same mixture without it, but, I believe, this property was partially known in the early days of Muntz metal sheathing. It has, however, been satisfactorily proven within the past year and the actual benefit to be derived from the use of tin is now not questioned. Muntz metal has long been known, having been invented by G. F. Muntz, of Birmingham, Eng., in 1832, after whom it was named. One of its first uses was in the sheathing of wooden ships, and, on account of being cheaper, replaced copper to a large extent. Many difficulties were encountered, however, notably uneven corrosion and pitting. Such obstacles were, no doubt, caused by the absence of tin and poor casting, and possibly to large admixtures of lead, as this element was used, at that time, in the manufacture of such sheathing metal. Such sheathing metal could, no doubt, have been much improved by keeping it free from lead and introducing a small quantity of tin.



THE "RELIANCE" UNDER SAIL, CLOSE HAULED.
Photo by New York Sun.

The term Muntz metal has now become a very common one, and signifies an alloy of copper and zinc, which works hot. Ordinary brass will not work hot, but by slightly increasing the content of zinc an alloy is produced which will possess this quality. Tobin Bronze, then, is really a variety of Muntz metal, as it is worked hot.

Tobin Bronze is the invention of John A. Tobin, who resided at Nyatt Point, Rhode Island, at the time he invented this alloy. The patent (No. 309,011) was granted to him in the United States on Dec. 9, 1884, on "A Composition of Metals," so that it has now already expired. A Lieutenant in the United States Navy, it is not surprising that he should have turned his attention toward the improvement of alloys. An abstract of his patent specification is as follows, viz.:

"My invention relates to certain improvements in composition of metals, also in the process of combining said metals for the purpose of producing homogeneous alloys, which are non-corrosive, suitable for casting or rolling, having great tensile strength and toughness, combined with durability and ductility, which can be bent into any shape either hot or cold, forged into bolts, etc.

"The essential elements of my alloy are copper, zinc and tin, preferably combined in the exact proportions hereinafter stated, and, if desired, purified or deoxidized by means of additions to the molten metal of phosphorus, phosphates or similar substances, including well-known fluxes for the purpose of improving the homogeneous nature of the finished product.

"I find from actual practice, that owing to certain peculiarities of my metal, it is specially adapted for piston rings and other rubbing surfaces, such as the wearing faces of slide valves, cross-head guides, and lining for pump cylinders; also, owing to its non-corrosive character, it is eminently suitable for any part of an engine in which the metal comes in contact with sea air, sea water or chemical vapors. Owing to the great strength and comparative low cost, these alloys can be economically employed in making shafting for launch machinery, tubing, plates and sheathing for vessels, torpedo boats, boiler plates, rods, rivets, castings for bronzes, angle bars, lightning rods, and wires, including telegraphic and telephonic wires, for which it is peculiarly adapted on account of its nature as a conductor of electricity and ability to withstand strains, thereby obviating sagging when the poles are spaced at long distances. These alloys are also peculiarly adapted for the manufacture of cotton ties, teeth, hooks, or similar devices employed in handling or manipulating cotton or analogous purposes, as a substitute for iron or other metals, where metal is liable to endanger property by 'striking fire.'

"For the production of my high test alloys I take, for example:

	PARTS.
Copper	58.22
Zinc	39.48
Tin	2.30

and preferably melt the tin and copper separately, and then mix the two and finally add all the zinc, care being taken during the melting operation to provide a reducing atmosphere, otherwise avoid contact of the air as well as volatilization of the constituent elements of the alloy. The metals when combined may be poured into sand or metal molds.

"The variety and purity of the metal used and the method of combining the same are subject to certain variations, but owing to impurities contained in the metal and the tendency of the molten charge to absorb gases, I find that in all compositions of copper, zinc and tin, when there is a doubt about the purity of either metal, it is essential to the best results that phosphates or siliceous fluxes or both should be added to the molten bath to thoroughly deoxidize and purify the metal. The percentage proportion of the three metals above given indicates merely a typical

formula and it is evident that the tin may be reduced two parts or any fraction of the amount named used; also, the proportion of copper and zinc may be changed, provided the metals are purified in the manner above described. For example, the copper can be diminished or increased two to eight parts and the zinc changed in the same manner, while the tin remains substantially the same, or the tin can be increased or diminished, but in all cases within certain limits.

"I find that the carefully purified and deoxidized compositions of copper, zinc and tin are phenomenally tough. They are also bright in color and not easily tarnished, and, as above stated, approximate the remarkable qualities of the typical formula.

"To more illustrate the economical results of my discovery I desire to specifically refer to the specimens which form a part of this application, which were produced under my supervision. These specimens, which are malleable and ductile, were rolled from an alloy of the composition defined in my typical formula, and were found to stand the test applied as follows: Specimen No. 1 was rolled from a cast bar, length of said bar being about twelve inches and having a diameter of 1¼ inches. Specimen marked No. 2, rolled from a cast bar of about the same size, was annealed and bent cold. Specimen marked No. 3 is a sample of the same melt and composition unannealed, which, when tested for tensile strength, stood a strain of 65,342 lbs. per sq. in. The same metal in the annealed state gave, by several tests, the remarkable result of withstanding strains of 71,680 lbs. per sq. in. Previous tests, when cold rolled, withstood a tensile strain 52 tons to the square inch.

"What I consider as my invention and desire to secure by letters patent is:

"1. The process of producing homogeneous alloys possessing the features described, which consists in melting copper, zinc and tin, thoroughly commingling the molten mass by mechanical agitation and finally adding to said mixture a deoxidizing agent, substantially as set forth.

"2. The homogeneous and ductile bronze alloy herein set forth, consisting of copper, zinc and tin, combined as and in the proportions specified.

"In testimony whereof I hereby affix my signature in presence of two witnesses. "(Signed)

"JOHN A. TOBIN."

This mixture, as specified by Tobin, is somewhat hard in itself, so that in practice it is not customary to use it in making sheet where cold working is necessary. For rods, however, the mixture is oftentimes used in practically the same proportions as specified in the patent. In the case of sheet, however, a little cold rolling is almost always given it in order to obtain the required gauge accurately and give a smooth and flat surface. This cold working also increases the tensile strength. The amount of tin in the alloy, therefore, is somewhat reduced and the copper slightly increased. To illustrate this point the analyses of Tobin Bronze rod and sheet given below are cited. From various analyses of this material purchased recently it would now seem that the company who makes it are using the same mixture for rods and sheet and relying upon the cold working to give it the requisite strength. The following tests and analyses will serve to illustrate this point:

COLD DRAWN PUMP ROD 1 INCH IN DIAMETER.

	As received.	Annealed.
Diameter (turned down)	0.744 in.	0.761 in.
Tensile strength per sq. in.	64,060 lbs.	56,330 lbs.
Elongation in 1 in. (fract. sec.)	53 per cent.	70 per cent.
Elongation in 8 in.	26 per cent.	49 per cent.

RESULTS OF ANALYSIS.

Copper	60.50 per cent.
Zinc	38.66 " "
Tin	.47 " "
Lead	.28 " "
Iron	.06 " "

SHEET 0.078 INCH THICK.

As received.	Rolled to 0.040 (cold).
Size, 0.078x0.582 inches	0.040x0.619 inches.
Tensile strength:	
Per sq. in., 66,000 lbs.	95,000 lbs.

RESULTS OF ANALYSIS.

Copper	60.62 per cent.
Zinc	38.40 " "
Tin	.55 " "
Lead	.30 " "
Iron	.07 " "

That Tobin Bronze possesses the property of resisting the action of sea-water in a satisfactory degree has been satisfactorily demonstrated, or it would not have been selected for use in the last three cup defenders. Were it not for this particular property steel would be used, as it is possible to obtain a much greater strength in nickel steel, now used on the "Reliance," than that obtained on Tobin Bronze. It is said that the tensile strength of the nickel steel used on this boat is 112,000 lbs. per square inch, while that of the Tobin Bronze is 80,000 lbs. per square inch. Nickel steel, however, is only slightly better than ordinary steel in the matter of resisting the action of sea-water, so that to expect a highly burnished surface like that obtained on Tobin Bronze to remain so during the trying period of the races is out of the question. This fact gives Tobin Bronze an unique place among the metals that have heretofore been tried, as it preserves the polished surface under these conditions. Aluminum has been found wanting in this respect, and steel requires painting, although possessing superiority in regard to strength. For this reason the Herreshoffs have built a composite boat, as shown in the subjoined sketch. Tobin Bronze is used below the water line, with steel for the remainder, while the deck is made of aluminum. The use of aluminum for the deck appears to be a matter well thought of in England, as the Shamrock III. is said to have one.

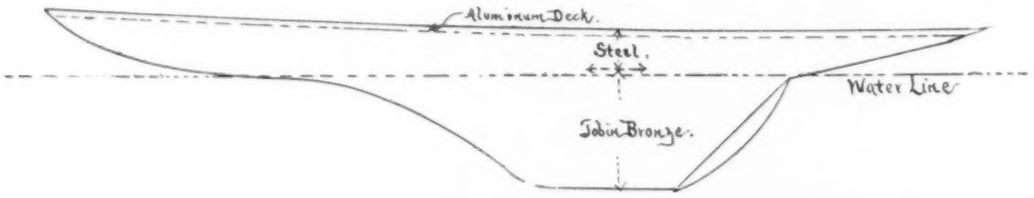


DIAGRAM SHOWING RELATIVE POSITIONS OF THE METALS USED ON "RELIANCE."

Tobin Bronze is mainly manufactured by one brass company, but others are now beginning to put it on the market; not as Tobin Bronze, for herein lies the value of a name, but as naval brass or under other trade names. The company who has made it for some time, however, is

remarkably well equipped for turning out all kinds of material and in extremely large sheets and rods. They have the advantage, therefore, in this respect over the others who are not as well equipped for this class of work.

In conclusion it may be said that the general composition of Tobin Bronze may be taken as a brass mixture consisting of 60 parts of copper and 40 parts of spelter, to every hundred pounds of which is added one-half a pound of tin. If not sufficiently strong, however, the amount of tin may be increased up to two per cent., but the copper and spelter should remain about the same.

The lead and iron shown in the analysis were not introduced into the alloy intentionally, but were impurities in the spelter (all spelter contains more or less lead and iron) and added, of course, along with it.

CASTING TOBIN BRONZE IN SAND.

Tobin bronze is a difficult alloy to successfully cast in sand, on account of the presence of such a large quantity of spelter* in the composition. Many have attempted it and failed; the results have usually been castings too dirty to use. A small amount of aluminum, say ¼ of pound to 100 pounds of metal, added just before pouring will transform the alloy into an entirely different metal and one which will give clean castings. For casting in iron molds, of course, aluminum should not be added.

PARSONS' MANGANESE BRONZE SHEET.

The fact that manganese bronze was used in the building of the hull of the "Shamrock II." though not in that of the "Shamrock III." makes the composition somewhat interesting, especially so, however, in comparison with Tobin bronze used on the Reliance. Manganese bronze, however, contains considerable iron and more tin than Tobin bronze and is much stronger in the cast state. Parsons makes two grades, one for sheet and the other for sand castings; the latter, however, containing a little aluminum. The following is an analysis of the grade used for sheet. Both, however, are conspicuous for the absence of any but traces of manganese:

	Per Cent.
Copper	60.17
Zinc	37.47
Iron	1.24
Tin	.99
Manganese	.02
Lead	traces

Although the analysis shows but little manganese, some was added during the process of making, but has oxidized out almost completely in the melting.

THE AMERICAN FOUNDRYMEN'S ASSOCIATION.

The American Foundrymen's Association have an elaborate programme for their convention to be held in Milwaukee, June 9, 10 and 11. There will be reports by the officers in various committees, and the reading of a number of papers on timely foundry topics. Some of the papers which will interest the readers of The Metal Industry are: "Molding Machines," by Edward Gilmour, Peoria, Ill., and there is also to be a discussion on "The Recovery of Nickel from Scrap Anodes." In addition to the business part of the programme there will be trolley rides to the new plants of the Allis-Chalmers Company, and also to the parks, breweries and other points of interest. The convention will wind up with a smoker at the Hotel Pfister, in which it is predicted that there will be a moderate consumption of the "stuff that made Milwaukee famous."

*See analysis of Tobin bronze elsewhere.

POWDERED ALUMINUM IN EXPLOSIVES.

One of the most valuable forms of aluminum is in the powdered state and the use of such material is constantly increasing. The value of paint made from such powder has been thoroughly demonstrated and now forms one of the staple and standard articles of commerce. Its value, at the present time, is never questioned, for the test of time has proved its superiority. The materials previously used for the purpose of making a white metallic paint were zinc, tin and silver. The zinc is open to the objections of tarnishing and not giving the dead white color so much admired in the aluminum paint. Tin, while not readily tarnishing, does not remain in a particularly bright condition but soon forms a dead surface over the entire article which gives it an unsightly appearance. Silver, of course, is too costly for general use and soon tarnishes. Aluminum, then, appears to be particularly suited for this use and the color and non-susceptibility to atmospheric influences place it in the front rank of metals for paint. In fact, it is only surpassed for this purpose by gold itself.

Powdered aluminum has quite recently been introduced into the field of explosives and a mixture of this material and nitrate of ammonia is now manufactured under the name of *Ammonal* It is claimed that this explosive is one of the safest known and is not subject to explosion from shock or friction and is reluctant in its burning qualities. The fact that aluminum is not at all acted on by nitric acid, renders the explosive particularly free from spontaneous decomposition. Not being affected by frost, the results so often followed in the thawing of frozen nitro glycerine (dynamite) products are not to be feared. The firing is done with the usual percussion cap.

Moisture is said to have no effect on it, an interesting feature, if so, because nitrate of ammonia is readily susceptible to such influence. The inventor says that he has successfully detonated cartridges made from this mixture containing 10 per cent. of moisture. This fact, if thoroughly proven, is of the utmost importance for all other explosives are greatly influenced by such absorption and are often ruined thereby. The old familiar adage of "keeping your powder dry" need not, then, be heeded in the case of *Ammonal.*

This explosive possesses many interesting features. For instance, by varying the amount of powdered aluminum the strength of the explosion may be varied. The gases resulting from the explosion are also said to be harmless. This, of course, is of great importance in mine blasting. Another feature is its not exploding when a shock is imparted to it. Cases are cited where shells of it were fired through thick steel plates without any result other than compressing it. The usual percussion cap then was tried with the result of producing the customary explosion.

This explosive opens up a new and large field for aluminum and we believe that other uses of powdered aluminum will, from time to time, be discovered.

A meeting of the representatives of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the American Institute of Electrical Engineers and the Engineers' Club was held in New York City, May 15, to discuss the offer of Mr. Andrew Carnegie to give $1,000,000 for a Union Engineering Building. Resolutions favoring the gift were drafted for presentation to the several organizations mentioned for ratification.

THE APPLICATION OF THE MICROSCOPE IN TESTING BRASS SHEET

The microscope has been used in the steel industry for some time as an adjunct to chemical analysis and the testing machine, but in brass-making or in the manufacture of other non-ferrous alloys the application has been devoid of useful results, for the reason that only materials which have no known "pedigree," so to speak, have been tested. For example, let us suppose that a piece of brass sheet is selected at random from stock, the surface ground and polished, etched and then examined under the microscope and photographed. The result, while interesting from a scientific standpoint as indicating the structure of the brass, shows nothing beyond this, as it is unknown whether the material is good, bad or indifferent.

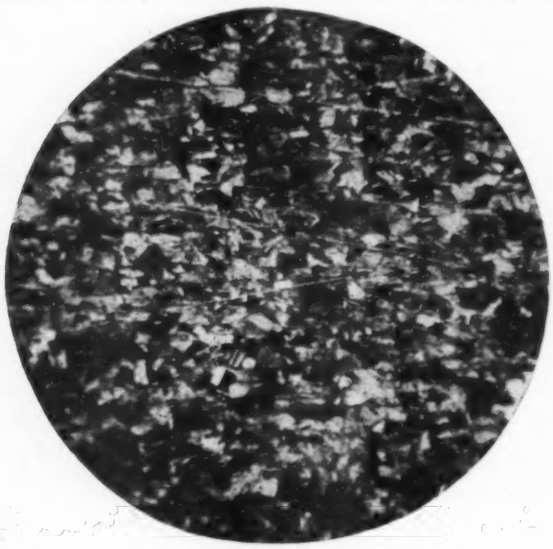


FIG. A.

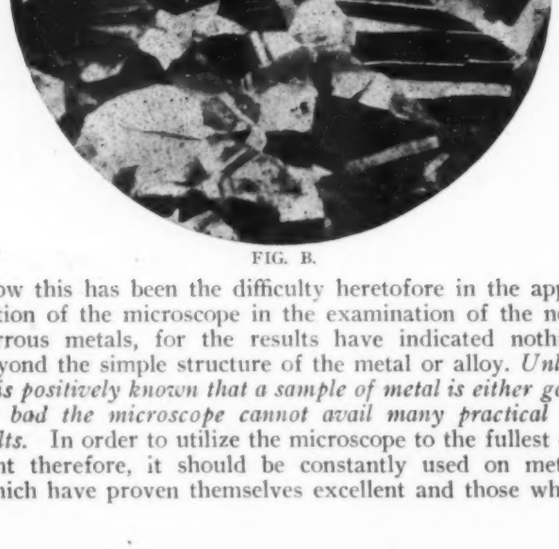


FIG. B.

Now this has been the difficulty heretofore in the application of the microscope in the examination of the non-ferrous metals, for the results have indicated nothing beyond the simple structure of the metal or alloy. *Unless it is positively known that a sample of metal is either good or bad the microscope cannot avail many practical results.* In order to utilize the microscope to the fullest extent therefore, it should be constantly used on metals which have proven themselves excellent and those which have worked badly. By obtaining a series of micro-photographs of metals under such conditions practical results are sure to follow.

A Naugatuck Valley brass rolling mill has submitted to us some micro-photographs of four samples of sheet brass which were made along the above lines. The brass sheet from which the photographs were made was used for drawing in press work, and some of the samples showed a tendency to pull apart during the drawing. Every brass manufacturer has this difficulty at times, and every one who works brass sheet has noticed it. Instead of the brass drawing up smoothly, there is a tendency to separate in the part which receives the most working. The surface has the appearance of having been purposely roughened, but upon close examination reveals the fact that the metal has actually begun to separate.

FIG C.

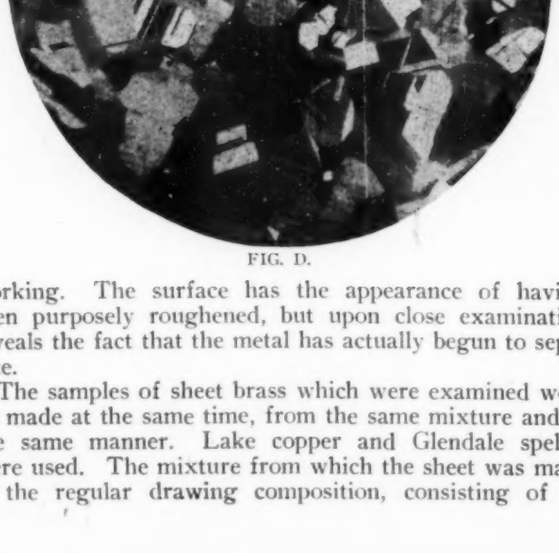


FIG. D.

The samples of sheet brass which were examined were all made at the same time, from the same mixture and in the same manner. Lake copper and Glendale spelter were used. The mixture from which the sheet was made is the regular drawing composition, consisting of 10

parts of copper and 5½ parts of spelter. This gives a "weighing-in" mixture of copper—64.51 per cent., and spelter, 35.49 per cent. On the assumption that the waste is about 1.5 per cent. in melting (which it generally is), the composition of the brass as made will be practically copper, 66 per cent., and spelter, 34 per cent., the regular mixture for cartridge or drawing brass. Unfortunately no analysis was made of the pieces tested, but this need not detract seriously from the results.

All the samples were polished, etched and magnified the same number of diameters. In sample "D," one-half pound of tin was added to 125 pounds of mixture to see if this metal would have any beneficial effect on the drawing. It appeared to have little effect however.

Fig. A is the sample which worked well, showed no tendency to separate during the drawing and behaved perfectly. Fig. B was the worst of the lot, as it manifested much tendency to open during drawing. The coarse nature of this metal is apparent. In Fig. C is shown metal which, while not particularly bad, gave a little trouble. Fig. D is the alloy which had one-half pound of tin added to 125 pounds of mixture, giving a "weighing-in" mixture of copper, 64.26 per cent.; zinc, 35.35 per cent., and tin, .39 per cent. This sample, while not as bad as "B," behaved like "C."

The fact will be noticed that the sample of brass sheet which worked well has the closest and finest grain or structure. The others have the coarse, crystalline structure or open grain. It is a fact long known that a close and fine grain fracture in brass indicates good metal, while a coarse or open grain will give trouble. The use of such fracture tests, however, can only be applied to cast metal; that which has been rolled into sheet is not susceptible. The microscope then reveals the structure, and if coupled with chemical analysis for telling the mixture will indicate where the difficulty lies. In the case of the above samples, the difficulty was probably in the annealing, although possibly it might have been in the casting. If brass is cast at too high a temperature or allowed to soak in the fire, the bar or plate often shows a coarse crystalline structure, but such metal generally cracks in breaking down. A coarse structure may be obtained in annealing, however, and has been appreciated for some time; it has been called "burnt" metal. The best method of detecting it is by means of the microscope, as it is a change in the physical condition of the alloy, and hence chemical analysis cannot aid us.

THE BALDT METHOD OF CASTING IN SAND.

In our February issue we described a process of casting in sand by means of a fusible metal pattern. The pattern is first rammed up in sand but not parted. The whole flask is dried and heated when the pattern melts and runs out leaving a space for the intended metal to fill. Mr. Baldt has been allowed a patent on an alloy for use for the fusible metal pattern (U. S. Patent No. 724,243, Mar. 31, 1903). The alloy which he patents consists of equal parts of lead, bismuth and zinc.

YAGER'S SOLDERING SALT.

This salt was patented in 1873, by Chas. E. Yager, of Hudson, N. Y., and the patent has long since expired. It consists of a mixture of sal ammoniac and chloride of zinc in the proportion of 100 parts of chloride of zinc and 1 part of sal ammoniac. They are both dissolved in 10 times the amount of water. It is claimed that this flux gives off no fumes when used and leaves the work in a much cleaner condition than when the ordinary zinc and acid flux is used.

THE LYNES PROCESS OF BRASS CASTING.

The preservation of the health of factory employees appears to be a subject that is receiving much attention in England at the present time. The matter has been taken up by Parliament and stringent laws framed and passed in connection with it. In the case of the manufacture of brass this has, no doubt, been brought about by the fact that the brass foundry and casting shop buildings are not as well designed in England as in our own country, but are of the low class of structures so prevalent in the early history of the brass industry. To be sure, we have many of such buildings in the United States, but a modern brass foundry or casting shop is free from such defects in design and the health of the employees of this industry undoubtedly is favored thereby.

The matter of brass melting and casting has received so much attention in England lately that it has stimulated inventors to attempt the elimination of the "spelter" smoke or fumes," the injurious feature of brass-making. William Lynes, of Sparkhill, England, has been one of these inventors and has produced an appliance to be used with a graphite crucible which is intended to eliminate, as far as possible, the existence of spelter smoke in the casting shop. The invention has been greatly lauded in England and was made the subject of a lecture by W. J. Davis, of Birmingham, General Secretary of the National Society of Amalgamated Brass Workers. Mr. Davis claimed that this apparatus would do more than twenty acts of Parliament in protecting the health of brass casters and foundrymen. He showed some photographs of casters working in an atmosphere so thick that they were scarcely visible, while those shops in which the Lynes method was used had only a small amount of smoke. Mr. Davis maintains that better work may be done in shops in which the Lynes process is used as a workman may see what he is doing, while in the old method he is obliged to carry out the operation of pouring in the thick atmosphere. We are pleased to say that not many of our brass casting shops are as bad as this case.

Mr. Davis goes on to say: "The apparatus used with the Lynes process cost only a few pounds, whereas manufacturers who thought of the health of their workmen now spend hundreds of pounds on fans and other ventilating methods without getting the desired results. The air became so thick after the molten metal had been poured into the molds in the old way that the men had to rush out of doors as soon as the process was over, thus endangering their lives in severe weather." Mr. Davis hoped that employers and employees would unite in urging the Government to make the adoption of this new process compulsory. He assured the audience that so unhealthy was brass casting that six workmen in Birmingham and surrounding districts out of 2,000 brass casters who were at work, could not be found over sixty years of age and that superannuation benefit of the society had to be given to the casters five years sooner than any others. "The rate of mortality in the casting trade," he says, "is fearful and our own president is dangerously ill in consequence of the deadly operation of brass casting." He said that it was not until 1834 that a Factory Act was passed in England and even at that period governments did not consider it to be their duty to preserve the health of workers. Gradually governments had been induced to recognize this important point and he instances the White Lead Act, Earthenware Enamelling, Flax-Making, Lucifer Match-Making, India Rubber Vulcanizing, Wool Sorting, Brass Casting and other industries now protected by the state.

The Lynes method of brass casting consists of an apparatus which fits over the crucible and to which is attached a flexible asbestos tube through which the spelter

smoke passes. The apparatus is applied to the crucible after it has been removed from the fire and allowed to remain on it until the pouring operation is completed. The apparatus is called a *"fume extractor"* and the elevation of the appliance is shown in Fig. 1.

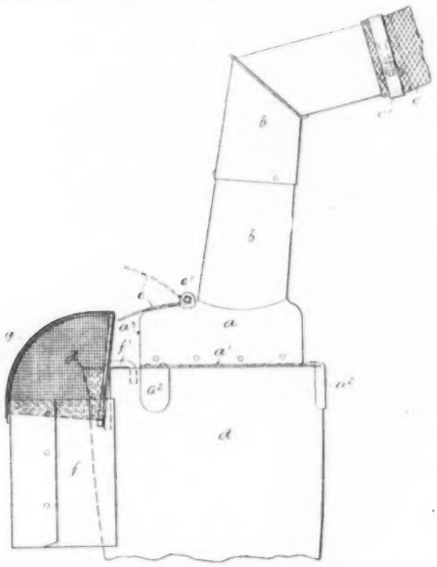


FIG. 1.

The bonnet *a* is made of iron or steel and covered with asbestos if necessary, or even may be made of clay. The lower edge has a flange *a'* which is provided with a series of depending ears or clips a^2. These serve to hold the apparatus in place. Leading from the hood is the outlet *b*, which may be made to have a swivelling movement if desired by means of a ball and socket joint and attached to this neck is the flexible tube *c* attached by means of the clamp *c'*. This tube *c* leads to the flue (see Fig. 5). Oftentimes there will be draught enough to answer the purpose without the application of fans or exhausters, but usually these are necessary.

In Fig. 2 is shown the cross section of the apparatus when applied to a crucible.

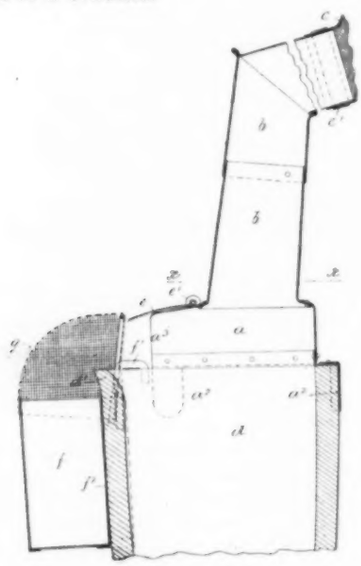


FIG. 2.

In Fig. 3 is shown a cross section of the apparatus looking down on the crucible.

In connection with the hood is used another piece of apparatus in the shape of a detachable pan *f* used for the purpose of receiving the skimmings. This is held by the hook *f'* to the mouth of the crucible and is protected by a shield *g* which may be of metal gauze or perforated metal. This shield is for the purpose of deflecting the fumes which arise from the skimmings to the hood and thence to the flue. A gap is left at *g'* for the insertion of the skimmer.

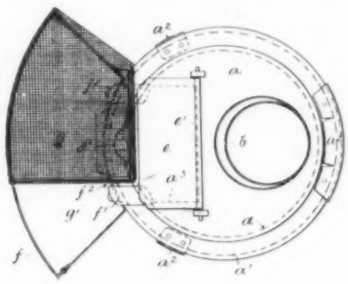


FIG. 3.

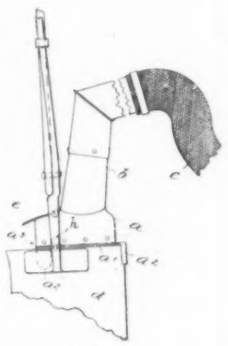


FIG. 4.

The hood is so designed that it does not interfere with the proper adjustment of tongs as is indicated in Fig. 4.

A flap or lid *e* is provided which is composed of mica and acts as a window through which the condition of the metal may be viewed. This lid is provided with a stout hinge *e'*. This lid also serves as a baffle to keep the fumes from coming out of the crucible.

In Fig. 5 is shown the whole operation of skimming and pouring by means of the Lynes appliance.

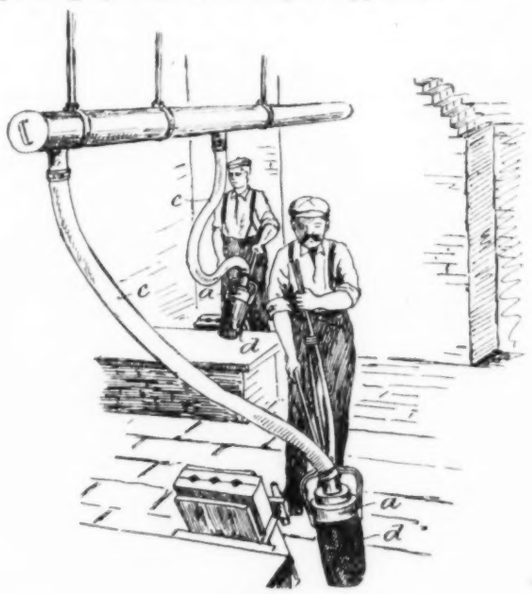


FIG. 5.

It will be seen that each appliance is connected by a considerable length of tube to a chamber and thence to the chimney. This chamber may be provided with a trap or door from which the oxide of zinc can be withdrawn from time to time and so become a salable article. Large quantities of oxide of zinc are consumed by the paint trade and this saving of the oxide by the apparatus is one of the advantages which Mr. Lynes claims for his invention. He also claims that the invention may be applied to other industries; notably those in which poisonous gases are produced.

THE FRENCH GRAY FINISH

This new name for an old finish simply indicates that among the old processes there are many which may be utilized on modern wares with beautiful effects. Several French-Gray finishes may be found on the market, but in our estimation there is but one which gives really artistic effects. This is the one in which platinum is used for the purpose.

To begin with let the French-Gray finish be described as there may be some of our readers who are not familiar with it. This finish is applied to silver goods both plated and sterling and consists of a matt or dead surface of a color a trifle darker than the natural color of the silver itself. This dark color is not sufficiently marked on the article as to savor of the old oxidizing process but to one who is familiar with the dazzling whiteness of silver, it immediately becomes apparent that there is something applied which subdues this color and tones it with a pleasing effect. It is our own experience that far more pleasing effects may be obtained on goods of fancy pattern with raised or figured work than on plain goods, but this may only be a matter of taste. At any rate we may say that it is more difficult to make a good job on plain work than on fancy on account of the trouble in producing an even coating free from spotting or dauby effects. Pumice stone (powdered) enters into the manufacture of the French-Gray finish to a considerable extent; in fact, some manufacturers are putting out a finish on silverware produced simply by means of pumice stone to give a matte surface. We do not see as much beauty in such a finish as that produced by platinum, but much of it is sold.

The French-Gray finish, then, may be divided into three classes, viz.:

1. That produced by the use of pumice alone (or its equivalent).
2. That produced by the use of pumice and sulphide of potash (liver of sulphur).
3. That produced by the use of pumice and chloride of platinum.

The finish produced in the first case is simply one formed by the liberal application of powdered pumice stone; the degree of fineness of which determines the quality of finish. If a very fine matte surface is desired, then the pumice must be fine. By varying the degree of fineness of the pumice stone the quality of the surface may be altered. Such finishes as this are only applicable to a good thick plate or sterling ware. The thin, cheap, plate found on some goods would be entirely worn through by the treatment. Displeasing or pleasing as this finish may be, there remains the fact that it forms quite a serviceable one as a highly polished surface only remains so a short time after the articles of flat or hollow ware have been put into use. This particular finish, however, may be kept intact as the ordinary materials employed in the cleaning or polishing tend to give this surface rather than a polished one.

We believe that such a finsh has been brought about by the growing tendency to eliminate the polished surface from all classes of artistic goods. In photographs a polished or glazed surface is a thing of the past; in interior decoration the same applies to the various wood finishes. In machine work what is more pleasing than the so called "wiped finish?" The desire for such surfaces now appears to have become settled in the silversmiths' trade, and the time is probably not far distant when all polished surfaces in artistic metal work will indicate an inferior class of work.

As regards the second class of French-Gray finish or that produced by the application of pumice and liver of sulphur, it may be said that this is simply an imitation of the real French-Gray finish and while it has the advantage of being much cheaper on account of the abscence of any platinum consumption, yet the color produced by the use of the liver of sulphur (sulphide of potash) is not as pleasing as the platinum finish nor is it as lasting. The color produced is more of a black or brown tint rather than gray and it is more difficult to get an even tint. The process, however, is extensively used in the flat-ware industry and is known as *The Butler Finish* by some. The method of applying is quite simple. Take for example, the handle of a ladle or table spoon which has a deeply figured pattern. An application of liver of sulphur is made and the black color produced all over; both in the raised and indented portions. The article is then washed, dried, and pumice applied with the hand to the raised portions so that a matte surface is produced. This leaves the indented parts with a black color while the prominent ones have the dead surface desired. The results, with the exception of the matte surface, are nothing more than a process of producing the so-called oxidized silver.

The liver of sulphur solution may be produced by simply dissolving the liver of sulphur as purchased, in water. If too strong, or gives too rapid and black a surface, the amount of water may be increased but it is usually employed strong. The articles should be well rinsed after the desired color has been produced. This finish is only aplied to the handle or figured portions of flatware as it is very difficult to produce any satisfactory results on the plain portions.

The use of platinum forms a very satisfactory means of producing the French-Gray finish and the result is the most pleasing. The color of the film of platinum formed on the surface together with the matte surface produced by the application of pumice stone powder renders this result difficult to surpass. The platinum is not deposited by electro-deposition, but is applied in the form of a dilute solution of platinum chloride either in water or alcohol. Ether has been recommended, but platinum chloride is only sparingly soluble in this so that our experience with it has not been satisfactory.

The platinum chloride may be either purchased or made. If it is desired to make it, then pure scrap platinum may be dissolved in a mixture of three parts of strong hydrochloric (muriatic) acid and one part of strong nitric acid (aqua fortis). A porcelain dish should be used for the operation and after the platinum has all been dissolved, the excess of acid should be driven off by evaporation. This platinum chloride which remains may be dissolved in either water or alcohol as will be explained later.

The article to which it is desired to give the French-Gray finish should be first finished by means of pumice stone powder or the equivalent. Upon this operation depends, in a great measure, the success of the final result, but it is difficult to lay down any rule for the use of the pumice. Some use the bare hand, others flannel buffs, others chamois and hand work. The fineness or coarseness of the pumice and method of using together with the matte surface desired are all matters which can be left to the judgement of the operator. It simply suffices to produce, at the beginning of the operation, a dead or matte surface upon which the platinum is applied. In order to produce the best results, this matte surface after it has been produced should be free from oil or grease or the platinum will not "lie" to the metal evenly or well. The solution of platinum is now applied to the surface with a camel's hair brush, or by dipping and the platinum is deposited on the surface as a blackish gray film. The

strength of the solution is a matter of vital importance for a strong solution will give an immediate black deposit which is not the color desired. It has been found by experiment that a one per cent. solution (1 part of platinum chloride to 100 parts of water) gives excellent results as the color is then produced quite slowly and can be easily controlled, whereas if a stronger solution is used the color arrives so rapidly that the deposit is apt to lack the uniformity of color. Although water may be used, it has been found that an alcoholic solution works better on account of the evenness of the deposit so produced. This is probably due to the alcohol dissolving any film of grease which may be on the surface and thus allowing the platinum chloride to act. In making up the solution alcohol may be substituted for the water.

The color is more rapidly formed on sterling silver than on pure, but there is no final difference in the result. The copper in the sterling probably induces a quicker action. The color desired is a matter of personal taste but a slight gray tint or that produced by an immersion of a minute or two is what is usually produced. The worked may be slightly warmed if it is desired that the solution should work more quickly, but we have found this usually unnecessary.

The color produced by the application of platinum chloride is that of metallic platinum which the silver reduces. At the same time a little of the silver is dissolved so that instead of the glistening appearance produced by the application of liver of sulphur, there is actually a tendency to form an even more matted surface than before the solution was applied. This fact works to advantage. The platinum which is deposited on the silver forms a lasting coating. In order to apply it to plated ware, however, a good thick coating of silver is required as otherwise the rubbing with the pumice may remove the exposed portions and expose the base metal.

WESSELL'S SILVER.

As far as known this is the only German silver alloy on the market which contains pure silver. We find in books examples of alloys of a similar nature, but we have never come in contact with any but this. The alloy was put on the market by the late Charles Wessels and has entered the flat ware trade for use as single metal ware and not for base metal. Whether the pure silver is an actual advantage remains for the user to determine, but we believe that it really works towards whitening the metal a little.

The sample which we have analyzed is simply a 20 per cent. German silver containing 2 per cent. of pure silver, but at the same time the amount of zinc is reduced from 20 per cent., or that in the usual 20 per cent. German silver, to 12 per cent. The following is the analysis, viz:

Copper	65.81 per cent.
Nickel	19.52 per cent.
Zinc	12.08 per cent.
Silver	2.09 per cent.
Iron	.42 per cent.

Sterling silver consists of 925 parts of pure silver and 75 parts of copper.

The J. W. Paxson Company, of Philadelphia, Pa., established 1855, manufacture brass furnaces and founders' supplies.

The Columbus Brass Company, of Columbus, Ohio, are sending out two new catalogues describing their brass goods.

SAWDUST FOR DRYING OUT.

After metals have been dipped, pickled, or plated they are rinsed in water to remove the solution that may adhere to them. The surface after rinsing is, of course, moist and if left to dry spontaneously the surface becomes discolored. To obviate this, it has been customary, even in the earliest days of the industry, to dry the article in sawdust; usually cold, but conducive to much better results if heated.

Simple operation that it is, it is surprising to find many using the cheapest grades of sawdust for this purpose and then wondering why the lacquer does not adhere or spots form on the surface. Upon first thought, one might naturally think that one kind of sawdust would be as good as another, but it is not so. A satisfactory sawdust must be dry and capable of absorbing as much water as possible and for this reason there is probably nothing worse than that obtained from the town sawmill. Full of yellow pine, it not only fails to do the work, but actually leaves pitch on the surface of the work to be dried. This kind of sawdust should be wholly avoided. White pine, spruce, or hemlock sawdust while superior to the yellow or pitch pine leaves much to be desired as it is not very absorbent. Maple or better still the well-known "Royal Hardwood" forms excellent materials and probably more of the latter is sold than any other kind. It has the advantage of not being expensive. Turkey boxwood is largely used by platers and forms an excellent sawdust for their work. It is also the most expensive.

THE FUTURE OF NICKEL

In his last report to the stockholders, A. Monell, President, says: "The prospects are better than for the year past. The demand for nickel is increasing and copper is now much higher than in 1902. When the new Canadian Company's plant is complete, its earnings should add largely to the earning capacity of the property. Every effort is being made to introduce nickel into new fields and extend its use in old lines, particularly the extension of the use of nickel steel. The results have been very gratifying; about 12,000 tons of nickel steel rails containing 3¾ per cent. of nickel have been purchased by American railways. Seamless drawn tubes containing a high percentage of nickel have been successfully manufactured and we look for an important market for these tubes. In addition to these it is probable that nickel steel will be used within a short time in bridge construction."

NICKEL ANODE PRICES

The following now represents the standard prices of nickel anodes. These prices have been agreed to by the largest makers:

Percentage of Nickel in Anode	1 to 99 lbs.	100 to 499 lbs.	500 lbs.
80-82 per cent.	50c.	47c.	45c.
82-84 per cent.	52c.	49c.	47c.
85-87 per cent.	54c.	51c.	49c.
90-92 per cent.	57c.	54c.	52c.
95-97 per cent.	59c.	56c.	54c.

Russia produces nearly all the platinum consumed in the world, and yet possesses no refinery capable of treating the ore. The ore is sold at a price of 13,000 roubles per pood, but what metal is consumed in the country must be purchased back at 25,000 roubles per pood. After many years of consideration the Russian Government has decided to grant a subsidy for the refining of platinum and a syndicate will establish a plant.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St,. New York

Q.—A plater asks for a method of copper plating aluminum so that it will not peel off. He is giving aluminum castings a copper plate and then an oxidizing finish, but finds that, after a time, the copper begins to peel off.

A.—This appears to be the great difficulty in plating aluminum and has not yet been entirely overcome. The use of the cyanide copper bath and connecting the work with the current before it is put into the bath will overcome it to a certain extent. A weak current should also be used as a tougher deposit is given. The plating of aluminum is a subject which needs investigation.

Q.—Information is desired about the melting of cupro-nickel containing 75 per cent. of copper and 25 per cent. of nickel. Our correspondent wishes to know whether he can use the ordinary brass crucible for melting the alloy and what to put on the molds. Also whether forced draught is required in melting.

A.—An ordinary brass crucible is used for melting this alloy and answers perfectly. Use the best quality of lard oil on the molds. If a high stack is one of the adjuncts of your casting shop and you run ten or a dozen fires, you will have no difficulty in melting this mixture, but if your draught is poor, it will probably bother you and you will have to use forced draught. The companies who make cupro-nickel, however, do not use it as they run so many fires and the stack is so high that the draught is ample.

Q.—A manufacturer wishes information on an alloy of 95 per cent. aluminum and 5 per cent. of phosphorus. He wishes to know how to mix the same?

A.—Our experience with this alloy has been very limited, and we can give no further information at present than the fact that it was recently patented; a feature which does not necessarily indicate that it is of any value. The introduction of phosphorus into melted aluminum requires great care and the employment of a phosphorizer such as those sold by the various crucible makers who advertise in our columns. The phosphorus must be thoroughly dried before attempting to introduce it into the aluminum.

Q.—A Western subscriber who has a brass foundry wishes some information in regard to the manufacture of car brasses and the mixture used for making them. He says that the railroads in his section are paying 14 cents per pound. The brasses are babbitted and he would like to know what the M. C. B. boxes are made from?

A.—The manufacture of car brasses is an industry in which the profit is determined by several conditions, viz: 1. The use of scrap metals; 2. The employment of the molding machine; 3. Large sales. There are many formulae for car brass mixtures, but in the cheap mixtures the formula is only approximately maintained. The average composition of low-priced car brasses is as follows: Copper, 70 per cent.; lead, 14 per cent.; zinc, 10 per cent.; tin, 6 per cent.

On calculating the cost of this mixture, it will readily be seen that little margin is left if new metals are used. The only "salvation" of the car brass maker is in the use of scrap. Even with the use of this material the profit is very small and the maker relies on a large business to reimburse him. The boxes are furnished with so-called babbitt metal lining in the freight car boxes, which slightly cheapens the cost as the manufacturer obtains a good price for the lead and antimony mixture used for the lining. Only the cheapest antimonial lead is used for this purpose.

The term M. C. B. has no relation to the mixture. It means Master Car Builder, the association of which all over the United States has adopted a standard form of car brass called Master Car Builders' Standard, so that one railroad may replace the boxes of another while needing repairing in transit. They are known by numbers and the patterns are standard.

Q.—A maker of spelter art goods has difficulty in plating them with copper before the final gilding. The copper deposits locally and in some deep portions of a pocket like nature, no copper at all is deposited. A sulphate of copper bath is used, slightly acid.

A.—The plating of spelter appears to be one of the troublesome features. In some establishments it is customary to use the cyanide bath for giving a thin coating of copper and then transferring to the sulphate bath. In putting work into the sulphate bath it should be connected with the current before putting into the solution.

Q.—A hollowware maker asks how he can smelt a mixture of britannia metal dust and sand so as to reclaim the metal.

A.—This can only be accomplished by means of a flux, and then it is a matter of some difficulty unless practised on a large scale. A flux of three parts of soda ash and one part of sea or white sand makes a good flux, but we doubt very much whether it will pay to smelt this in a crucible on account of the cost of the latter. The smelting works which does this has large reverberatory furnaces for the purpose. We are not acquainted with any hollowware concerns who smelt their own refuse, as they have, for the reason stated above, found it more expedient to sell it.

A NEW USE FOR ZINC.

In the majority of instances zinc is used in the domestic economy because it is cheap, and not on account of any particular property. F. G. Fowler & Co., of Bridgeport, Conn., are now making a shaving cup out of zinc, an invention of Mr. F. C. Fowler, which is a radical departure in this line. No other metal but zinc will answer the purpose, and the whole cup, with the exception of the handle, is made from it. The theory of its action is the formation of a galvanic couple between the razor and the cup, which prevents the corrosion of the razor's edge. The many testimonials received testify to the ease with which shaving may be performed by its use, as the edge is maintained on the razor for a surprisingly long period.

The Waterbury Clock Company, of Waterbury, Conn., are increasing their facilities by the erection of a four story building.

The Housatonic Manufacturing Company, of New Haven, Conn., have entered into the manufacture of silver plated ware, in addition to their line of tinned spoons and brass goods.

TRADE NEWS

The Pittsburg Brass Foundry Company have reorganized, and will build a brass foundry in that city.

F. E. Drake has been elected president of the Lanyon Zinc Company, St. Louis, Mo., vice J. S. Rodgers, who has been made managing director of the company.

The American Brass Pipe Company, of Connellsville, Pa., have been incorporated under the laws of New Jersey, with a capital of $500,000.

The Manufacturers' Foundry Company, of Waterbury, Conn., manufacturers of brass and iron castings, have decided to build a new foundry 80 x 400 feet.

The New Era Lustre Company, of New Haven, Conn., are putting on the market a remedy for burns, called "Burnease Oil." They especially recommend it for foundry use.

E. B. Seidel, formerly proprietor of the Tacony Crucible Works at Philadelphia, has become associated with the Taunton Crucible Works of Taunton, Mass., in the capacity of manager. The works of the latter will, in the near future, be much enlarged.

The Simeon L. and George H. Rogers Company, of Hartford, Conn., have purchased the building formerly known as Factory H of the International Silver Company, and will now have increased facilities for manufacturing.

The Edward Miller Company, of Meriden, Conn., are about to enter into the manufacture of gas and electric fixtures in connection with their lamp business, and are erecting a four story building for this purpose.

The Acorn Brass Company, of Chicago, Ill., have returned to the building from which they were forced out by fire in December, at Green, Fulton and Peoria streets, and are installing an entirely new equipment of machinery.

The Waterbury Farrel Foundry is making the equipment for the Canada Metal Milling Company, of Toronto, Can., who are embarking in the brass rolling mill industry. They intend to manufacture brass and cold rolled copper. This will be the first brass and copper rolling mill in the Dominion of Canada.

The Ajax Metal Company, of Philadelphia, have one furnace in operation in their new smelting works and will have three more in service in the course of a few months. The Ajax works will soon be able to produce 100,000 pounds of metal a day. They have already sold 4,000,000 pounds of their new bearing metal, Ajax Plastic Bronze. This bearing bronze is being used extensively by the brass rolling mills.

The American Brass Company, of Waterbury, Conn., comprising the works of The Coe Brass Company, of Torrington; The Benedict and Burnham Company, The Westbury Brass Company, The Holmes, Booth and Haydens Company, of Waterbury; The Ansonia Brass and Copper Company, have for the summer months, granted their employes a half holiday on Saturday with full pay.

The Walworth Manufacturing Company are building a new brass and iron foundry at their plant at South Boston, Mass.

The Hamlin and Emery Brass Company, of Boston, Mass., are sending out a circular calling attention to their two trade marks which they have copyrighted.

The Chicago Brass Workers' and Metal Trades' Association have come to an agreement and signed a wage scale. About 600 men are affected by the agreement.

The United Lead Company have made application for an increase of capital stock to $25,000,000, and it is said that they intend to compete with the National Lead Company, claiming a cheaper process of refining.

The Osceola Foundry and Specialty Company, of Osceola, Ind., have been organized for the purpose of manufacturing a special bottling device. They will also make brass and aluminum castings and do electroplating.

Thirty-four makers of fire brick have consolidated and reorganized under the name of the American Refractories Company. They have been incorporated under the laws of Pennsylvania.

The Lippold Valve Company are about to put on the market a new valve in which the seat and disk may be changed under pressure. They are building a new factory at Erie, Pa.

The S. Obermeyer Company, manufacturers of foundry equipments and supplies, are greatly enlarging their Chicago plant. This will give them at least 40 per cent. greater capacity in Chicago. This company now has three plants in operation and is running 20 hours per day.

The new brass and copper rolling mill of the Canada Metal Milling Company, of Toronto, Canada, is equipped with brasses of Ajax Plastic Bronze. The brass and copper rolling mill trade is rapidly appreciating the fact that this is the ideal alloy for this purpose.

The Racine-Babcock Fire Extinguisher Company, of South Milwaukee, Wis., have added facilities to their plant for turning out a larger volume of high grade metal castings, such as brass, phospher bronze, aluminum, etc.

The Scovill Manufacturing Company, of Waterbury, Conn., have purchased at public auction the property of Matthews and Willard Mfg. Company. The Scovill Company were the largest creditor, and bought the plant for $157,000. The inventory showed a valuation of $212,864. The Matthews and Willard Company manufactured brass goods, and it is understood that the plant will start up again.

Dings Electro-Magnetic Separator Company, of Milwaukee, Wis., have just turned out a new type of magnetic separator, especially designed for handling very fine floury material, which is said to be a difficult proposition when large capacity and perfect efficiency is required. This new machine is announced to be an improvement worth considering. They now build six different types of separators, and are prepared to meet any kind of a proposition requiring magnetic separation.

TRADE NEWS

It is reported that Messrs. Cooper and Barber will establish a brass foundry at Leetonia, Ohio.

Ingot molds of the highest grade is a specialty of the Sessions Foundry Company, of Bristol, Conn.

The Brass Founders' Supply Company, of Newark, N. J., are putting on the market a band sprue saw which is sent to prospective buyers on approval.

A Mexican syndicate is considering the establishment of an aluminum reduction plant in the State of Jalisco, where there is abundant water power.

The New Jersey Aluminum Company have framed in aluminum the photograph taken at Pittsburg of the members of the American Aluminum Association.

The Thomas F. Lukens Metal Company, of Philadelphia, Pa., have moved to larger quarters at 238 North Fourth street, in the same city.

A clock that will run one year with one winding is being put on the market by the Year Clock Company, 81 Crosby street, New York. The clock has a spring movement and the case is finished in a gold plate.

We received an inquiry for the maker of an electrical engraving machine which was in use by some aluminum manufacturers a few years ago. Any of our readers who know the address of the makers of such a machine will please advise The Metal Industry.

The S. Obermeyer Co., of Cincinnati, O., have recently put on the market something entirely new in the way of making follow boards. It is called "Peerless Follow Board Compound" and obviates the need of chiselling out a follow board from wood. Being furnished in powdered and liquid form it is easily used and soon becomes as strong as the wood itself. Full directions accompany it.

The Buckeye Aluminum Company are now located in their new factory at Doylestown, Ohio, and are ready for business. They have a shop 100 x 40 feet, and already have orders enough to keep their works running for nine months. Some six months ago The Buckeye Aluminum Company bought the Bay State Aluminum Company, of Quincy, Mass.

The Aluminum Department of the School of Arts, of Madras, India, has issued a new catalogue, which is larger and more fully illustrated than any catalogue they have heertofore issued. It contains 77 pages and describes and illustrates a greater variety of articles made in aluminum than is probably turned out by any other factory in the world. The catalogue contains a great deal of interesting information for aluminum manufacturers and dealers.

The Metropolitan Aluminum Manufacturing Company, of New York City, have been incorporated with a capital of $25,000 to manufacture and deal in aluminum and other metals. The officers are: Harry Baum, president; Max L. Wall, vice-president; Adolph Selikowitz, secretary and treasurer. The company have been manufacturing aluminum goods at 89 Crosby street for a number of years past, but expect to move into larger quarters.

Lehman Brothers, metal dealers of Hoboken, N. J., make a specialty of scrap aluminum. Also scrap metals of every description.

The Freeport Foundry Company, of Freeport, Ill., announce that they make a specialty of light aluminum castings.

Sawdust for platers' and brass manufacturers' use has been manufactured for a number of years by John Sommer's Son, of Newark, N J. They manufacture all of the best grades.

On account of the great demand for their brass specialties the Lunkenheimer Company, of Cincinnati, Ohio, have been compelled to increase their foundry output 50 per cent. New machine tools are being installed as fast as they are obtained.

A consolidation has taken place between the Mansfield Manufacturing Company, Limited, of Pittsburg, Pa., and the Bailey-Farrell Manufacturing Company, of the same city. Both companies are manufacturers of brass and lead goods.

The Loomis-Pettibone Company have recently moved into new offices at 52 Williams street, New York, and increased their capitalization to $2,000,000. They will soon build a large plant near New York for the manufacture of gas engines, and until their own plant is in operation will continue to sell the engines manufactured by Crossley Brothers, Limited, Manchester, England, for which they are agents.

The Charlier furnace, of which W. S. Quigley & Company, of Philadelphia, are agents, is coming into general use. There are many advantages of this type of furnace. The lining is not expensive, as it is in other furnaces of a similar type and the rolling feature of the furnace renders it an easy matter to mix the metal. The first cost is much less than the other types. The Eaton, Cole and Burham Company, of Bridgeport, Conn., have recently installed one and are about to put in several more. Their use by a company of such experience and judgment is an excellent recommendation.

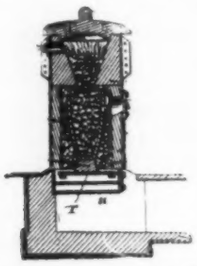
The W. H. Kemp Company, New York, who have sold aluminum before it was manufactured in the United States, report an increasing demand for sheet, ingots, rod and wire. Also for oval rod for molding purposes and for rivets. They make a specialty of sheet aluminum for automobile and electrical manufacturers and metal spinners, and carry in stock sheet in widths to 36 inches and 10 feet in length They roll to order sheet 60 inches wide. They also sell platers' brass, oreide and German silver and pure 999 fine platers and battery silver. They also make a specialty of bronze powders and powdered aluminum, which they sell in all of the different grades used by the trade. They carry in stock the best grades of bronze powders.

The Metal Industry Publishing Company of New York City, announce that they have purchased the rights, title and good will of the Brass Founder and Finisher and Electro Platers' Review of Philadelphia, which has been incorporated in The Metal Industry.—*The Metal Worker.*

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

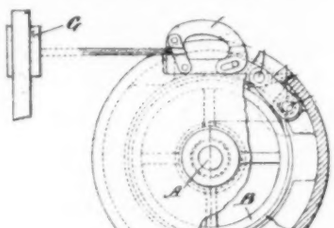
722,831, March 17, 1903. CRUCIBLE SMELTING-FURNACE. Otto Forsbach and Eduard Clerc, Mülheim-on-the-Rhine, Germany.—



In a crucible smelting-furnace, a crucible suitably supported above the grate bars with a receiving portion arranged above the crucible and communicating therewith, the receiving portion having an outlet extending thereinto above the material in the receiving portion, a cover arranged on the receiving portion, means for permitting the fuel to be fed around the crucible, the heat rising from the fuel, entering the receiving portion, directly engagin gthe material in the receiving portion previous to its exhaust through the said outlet, substantially as described.

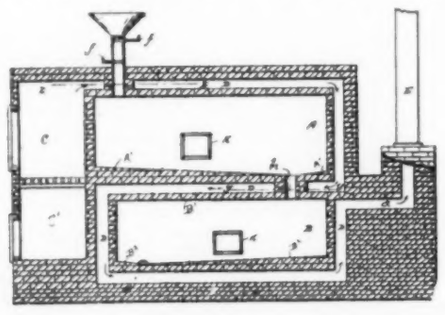
724,503, April 7, 1903. SOLDER.—Edward C. Rice and Henry F. Monk, Cripple Creek, Colo. An aluminum-solder resulting from the fusion of mercurous chloride, nineteen parts; magnesium chloride, fifteen parts; zinc, twelve parts, and cadmium, nine and one-half parts.

725,473, April 14, 1903. DRAWING ROLL OR HEAD FOR WIRE-DRAWING MACHINES.—John H. O'Donnell, Waterbury, Conn. The



combination in a drawing-roll, of a continuously rotating shaft, a rim fixed on said shaft, a roll loose on said shaft and means for providing for a gradual and frictional connection between the roll and rim, comprising a friction-band carried by the rim and mechanism for adjustably tightening the same carried by the roll to have the roll rotate with the rim.

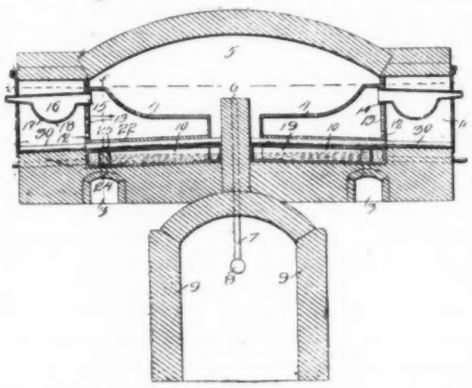
725,661, April 21, 1903. SMELTING FURNACE.—Edgar F. Blessing, Philadelphia, Pa., assignor of two-thirds to Herbert M. Shimer, Philadelphia, Pa., and Frank Blessing, Harrisburg, Pa. A device of the class described, consisting of a heating-chamber,



a fire-box therein, a main muffle within said chamber contacting with said fire-box, and a continuous flue surrounding the muffle and leading from the fire-box, a supplemental muffle within the chamber beneath the main muffle, a flue surrounding the supplemental muffle, and an opening in the bottom of the main muffle communicating with the supplemental muffle through the top of the latter; a floor in the main muffle inclined toward the opening, a tap-opening in the supplemental muffle at the opposite end thereof from the communicating opening of the two muffles, a floor in the supplemental muffle inclined toward the tap-opening, and doors in said muffles.

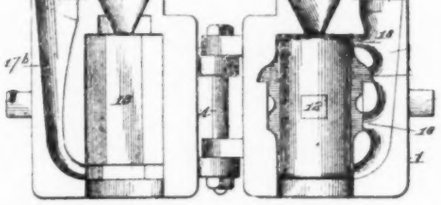
726,588, April 28, 1903. ALLOY.—William G. Stevens, Memphis, Tenn., assignor of one-half to Sidney Milton Neely and J. Walter May, Memphis, Tenn. An alloy formed by fusing and thoroughly mingling the following ingredients, to-wit: Copper, seventy-five per cent; tin, twenty per cent.; borax, 2.5 per cent., and lamp-black, 2.5 per cent.

726,432, April 28, 1903. APPARATUS FOR REFINING ZINC SPELTER.—Thomas Jones, Iola, Kan., assignor of one-half to Nelson F. Acers, Iola, Kan. In an apparatus of the character specified, the



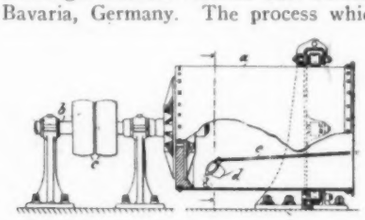
combination with a muffle, of a water-bosh disposed beneath the same and provided in its top with a channel, and a boxing housing the forward end of the muffle and having its bottom provided with a channel registering with that of the water-bosh and operating to conduct the molten metal without the furnace in case of breakage of the muffle.

726,523, April 28, 1903. MOLD FOR BRASS JOURNAL-BEARINGS.—Frank J. Friese and John E. Gilbert, St. Louis, assignors of two-thirds to Edward A. More, St. Louis, Mo. The combination of a



sectional mold provided with an ingate contained partially in one of its sections and partially in the other and leading to the bottom of the mold-chamber, and a series of sprues leading from said ingate to the mold-chamber.

726,932, May 5, 1903. PROCESS OF MANUFACTURING BRONZE POWDER.—Karl Huth, Brandsdorf, Germany, assignor to Bronzefarbenwerke Aktiengesellschaft vormals Carl Schlenk, Roth, near Nuremberg, Bavaria, Germany. The process which consists in



pouring out the metals onto the surface of a rotating hollow cylinder, so that the metals are carried forward by the cylinder until the cooled bands peel off, and then stamping the bands to a fine powder.

Metal Prices, June 8, 1903

METALS.

	Price per lb.
TIN—Duty Free.	
Straits of Malaca	28.12½
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	14.75
Electrolytic	14.75
Casting	14.00
SPELTER—Duty 1c. per lb.	
Western	5.90
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.40
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	7.75
Hallets	7.00
Other	6.50
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 60
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.53
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask	47.50

Sheet Lead, 7¾c. per lb., 20 per cent. off.
Lead Pipe, 6¾c. per lb., 20 per cent. off.
Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 7.50c. per lb., open, 8c. per lb.
Tobin Bronce—Rods, Unfinished, 19c.
Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS.

	Buying.	Selling.
Heavy Cut Copper	12.00c.	13.00c.
Copper Wire	11.00c.	12.00c.
Light Copper	10.50c.	11.50c.
Heavy Mach. Comp	11.00c.	12.00c.
Heavy Brass	8.00c.	8.75c.
Light Brass	6.00c.	6.75c.
No. 1 Yellow Brass Turnings	7.50c.	8.00c.
No. 1 Comp. Turnings	9.50c.	10.50c.
Heavy Lead	3.85c.	4.00c.
Zinc Scrap	4.00c.	4.25c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER.

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	20	21	21	21	21	22
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	22
	Longer than 96 ins.	20	21	21	21	21	23
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	20	21	21	21	21	23
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	21	21	23
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	21	22	24
	Longer than 120 ins	20	21	21	22	23	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	20	21	21	22	23	25
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	22	24	26
	Longer than 96 ins. Not longer than 120 ins.	20	21	21	23	25	29
	Longer than 120 ins.	20	21	22	24	27	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	20	21	21	22	24	27
	Longer than 72 ins. Not longer than 96 ins.	20	21	21	23	25	30
	Longer than 96 ins. Not longer than 120 ins.	20	21	22	24	27	
	Longer than 120 ins	21	22	23	25	29	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	20	21	22	24	29	
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26	31	
	Longer than 120 ins.	21	22	24	29		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	21	22	24	27		
	Longer than 96 ins. Not longer than 120 ins.	22	23	25	28		
	Longer than 120 ins.	23	24	26	30		
Wider than 108 ins.	Not longer than 132 ins.	24	25	27			
	Longer than 132 ins.	25	26	29			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, June 8, 1903

COPPER BOTTOMS, PITS AND FLATS.

Net Cash Prices.

14 oz. to square foot, and heavier, per lb	25c.
12 oz. and up to 14 oz. to square foot, per lb	26c.
10 oz. and up to 12 oz	28c.
Lighter than 10 oz	31c.

Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS.

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE.

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.31
Above No. 10 to No. 16	.23½	.27½	.31½
Nos. 17 and 18	.24	.28	.32
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 2 in. to 3¼ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb	33	29	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING.

Brown & Sharpe's Gauge the Standard.

												Per lb.
Plain	Round	Tube,	¾	in.	up	to	2	in.,	to No.	19,	inc.	$0 35
"	"	"	⅞	"	"		¾	"	"	19,	"	36
"	"	"	1	"	"		⅞	"	"	19,	"	38
"	"	"	1⅛	"	"		1	"	"	19,	"	41
"	"	"	1¼	"	"		1⅛	"	"	19,	"	48
"	"	"	1⅜	"	"		1¼	"	"	19,	"	65
"	"	"	1½	"	"		1⅜	"	"	19,	"	1 00
"	"	"	1⅝	"	"		1½	"	"	19,	"	1 50
Smaller than ¼ inch												Special
2 inch to 3 inch, to No. 19, inclusive												38
3 inch												40
Over 3 inch to 3½ inch												45
Over 3½ inch												50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM.

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than.. And Including..	55 in. 60 in.	50 in. 55 in.	45 in. 50 in.	40 in. 45 in.	36 in. 40 in.	30 in. 36 in.	24 in. 30 in.	20 in. 24 in.	18 in. 20 in.	16 in. 18 in.	14 in. 16 in.	6 in. 14 in.	Not wider than 6 in.	*8 in. 12 in.	in coils.	Polished two sides double above picture.	Satin Finish two sides double above picture.	Sat. Fin. with-out Lacquer. One Side.	Polishing One Side.
No. 13 & heavier	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 14	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 15	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 16	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 17	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 18	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 19	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 20	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 21	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 22	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 23	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 24	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 25	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 26	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 27	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 28	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 29	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 30	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 31	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 32	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 33	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 34	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 35 & 36	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 37 & 38	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" 39 & 40	50	49	48	48	47	47	47	44	44	44	44	42						6	2
" .008" to .0015"	50	49	48	48	47	47	47	44	44	44	44	42						6	2
Less than .0015"	55	49	48	48	47	47	47	44	44	44	44	42						6	2

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds	10 per cent. off list.				
1,000 to 2,000 "	10 per cent. and	2	"	"	
2,000 to 4,000 "	10	"	"	3	"
4,000 pounds and over	10	"	"	5	"

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4	.....	.....	.....	10	9	8	7	1-4
5-16	.....	.....	.....	11	9	8	7	5-16
3-8	.....	.....	.....	12	9	8	7	3-8
1-2	.....	.....	17	14	11	9	8	1-2
5-8	.....	.....	21	16	13	12	.....	5-8
3-4	.....	.....	25	19	16	14	.....	3-4
7-8	.....	.....	28	22	18	16	.....	7-8
1	.....	.....	30	25	21	19	.....	.....1 00
1 1-4	.....	.....	36	30	25	.....	.....	.....1 1-4
1 1-2	.....	52	43	35	28	.....	.....	.....1 1-2
1 3-4	.....	60	50	41	33	.....	.....	.....1 3-4
2	84	68	58	47	37	.....	.....	.....2 00

Discount 20 to 30 per cent.

ALUMINUM.

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B. & S. G'ge.	0000 to No. 10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.